

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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SUBJECT: International Trip Report

DATE: 01-02-75

STATINTL

FROM: John P. DeKany, Director, Emission Control Technology Division

THRU: Eric O. Stork, Deputy Assistant Administrator, MSAPC

TO: Associate Administrator for International Affairs

This trip report covers a visit by three ECTD members to Ricardo Engineering in Shoreham-by-Sea, England for the purpose of monitoring an EPA contract program and a visit of a 5-man delegation to the Soviet Union to participate in a meeting of the experts of the US-USSR working group on "Transportation Source Air Pollution Control Technology".

Messrs. Ralph Stahman, John McFadden, and the undersigned visited laboratories of Ricardo Engineering Limited in Shoreham-by-Sea, England on December 6, 1974. The purpose of the visit was to monitor the stratified charge engine contract program that Ricardo is doing under contract # 68-03-0375. Mr. McFadden is the Project Officer on the contract and the work is done as a program in Mr. Stahman's Branch. For Ricardo, Mr. M. L. Monaghan is the Project Officer under the direction of Mr. Cecil C. J. French and Dr. R. A. Haslett has been doing most of the work which was reviewed during the monitoring visit. The status of the literature survey was discussed and it was pointed out that quite recently (late October) a large number of new stratified charge engine references became available and for that reason the phase has been reopened to accomodate these new sources. A no cost extension to the contract period will be requested for that purpose. It was explained to Ricardo personnel that the forthcoming suspension hearings will require up to date information on the CVCC, Texaco, and PROCO type stratified charge engines. Ricardo agreed to reorganize their scheduling in order to expedite the evaluation of those three types of engines by the first of February. Ricardo requested some information on standard engines which they could use for their baseline comparison with the various stratified charge concepts and Mr. McFadden will provide that information. In reviewing the activities by Ricardo on two-cycle engines, it became obvious that much of the information would be useful in a technology assessment for motorcycles and a discussion ensued of the practicability of a further contract modification which would make use of that experience. Ricardo agreed to put together a letter proposal on the motorcycle emission control study for our consideration.

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At the conclusion of the contract review, EPA personnel were given a tour of the Ricardo laboratories which include complete facilities for designing, building, and testing internal combustion engines. Emission and noise abatement facilities were shown and a number of single and multicylinder test stands were demonstrated where fuel and lubricant tests were being run.

Dr. Joe Somers of EPA and Mr. Charles Heinen of Chrysler Corporation joined the other three EPA representatives in London on December 8, 1974 and the group travelled to Moscow where we were met by the Soviet Delegation. Dr. Drozdov, the new head of the Soviet Working Group on Transportation Source Emission Control, was particularly helpful in organizing our departure from the airport, providing transportation, and check-in at the Ukraine Hotel. A short meeting of the US-USSR Working Group was held at the hotel to review anticipated 1975 activities so that a written summary could be provided to Mr. Train for his separate meeting. The names of the Soviet Delegation and their affiliation are provided in the attachment to this report.

A series of five meetings were initiated on Monday December 9, and the highlights of those meetings were as follows:

1. The Soviet side was extremely cooperative with no arguments on protocol or agenda items and after brief introductory remarks both delegations got right into the technical discussions in a matter of minutes of our first meeting.
2. The Soviets had some significant programs in their proposed protocol including a desire to set up international standards using the CVS procedure and a self weighting driving cycle which is more representative of the European type driving than that which is presently found in the US LA-4 cycle. A study of such a uniform international test procedure for both light duty and heavy duty vehicles has been added to the protocol.
3. The Soviet Delegation admitted to having problems in purchasing emission measuring equipment of the type used in the United States for reasons of both the gold drain limitations of the Soviet Union and internal rivalry for budget allocations. They were quite frankly embarrassed by this delay and asked for the assistance of members of our delegation in the technical and cost review of proposals that they receive on equipment. Mr. Heinen will be contacting the auto industry to determine whether some surplus equipment might be made available to the Soviets for their use.

4. The representative from the Soviet Aircraft Ministry indicated that he would like to deal directly with EPA rather than through the existing Soviet delegation which is primarily concerned with ground vehicles. He agreed to provide comments on EPA Aircraft Regulations on an informal basis prior to establishment of any official relationship.

5. A particular highlight of the trip was the opportunity for the US Delegation to visit the Russian residence of a Soviet Working Group member for dinner and home movies. Such visits represent a break-through in US-Soviet relations and exemplify the strong feelings of friendship between the two delegations.

The following is a detailed breakdown of the agenda for the five days of meetings:

December 9 - The first day's technical sessions were held in the Ukraine Hotel conference room. The five US representatives met with the eight representatives of the USSR Working Group listed in the attachment and approximately ten additional experts from NILTD and other Soviet institutes.

Dr. Drozdov, head of the Soviet Delegation opened the session with introductions of his people and a report on "Current Status of Toxicity Reduction from ICE in the USSR in Fulfillment of the Plan for Soviet-American Cooperation". Mr. Drozdov briefly discussed the history of Soviet interest in air pollution dating from early interest in air quality in mines until the most recent 5-year plans which include a research program through the 1975 year with implementation of transportation source emission regulations for hydrocarbons and carbon monoxide in 1977. First standards representing a 30% reduction from conventional baseline will apply to passenger cars but characterization will continue on tractor, off-highway vehicles, aircraft, marine vehicles, and locomotives. NILTD, the organization represented by Dr. Drozdov, is the lead organization in the Soviet Union for transportation source air pollution control. NILTD is the Central Research Laboratory of Engine Toxicity and is part of the Ministry of Tractor and Agricultural Machine Building. The other organizations involved in transportation source air pollution control in the Soviet Union are the Ministry of Automobile Manufacturing, the Ministry of Aircraft Industry, and the Central Research Institute of Fuel Equipment for Automobiles. Some additional effort is made in various polytechnical institutes and academies of Science. Dr. Drozdov is responsible for the coordination of the emission control activity of all of these various groups.

One of the key items mentioned in Dr. Drozdov's presentation was a desire to modify the protocol which was signed in the United States last April. A portion of the protocol which involved exchange of vehicles and control systems for correlation and evaluation will not be possible on the schedule planned because, as of this time, the Soviets have not acquired equipment to run the US procedure. The US side agreed to that modification. The Soviets proposed an additional item in the protocol which involved the application of modeling the vehicle-atmosphere relationships. They discussed the usefulness of a meeting of the Soviets in the United States in the first half of 1975.

The second presentation was made by Mr. DeKany, head of the US Delegation in a discussion of the status of the regulatory program in the United States. He reviewed the scope of the problem in the United States, the history of the Federal regulatory process, and the kind of equipment being used on the latest model cars. He included discussion of the fuel economy penalties realized by early emission controls and the fact that the 1975 catalyst systems have more than compensated for those losses. He mentioned the additional studies being made by EPA into other pollutants and mobile sources than those that are now regulated.

Mr. Stahman presented data collected in the United States on the Correlation of European and Federal procedures and a list of definitions of terminology which had been reviewed and updated by the American side.

The next presentation was made by Dr. Somers on "Research and Development of Pelleted and Monolithic Catalysts for Oxidation and Reduction". This included information of the oxidation catalysts used in 1975 vehicles and various reduction catalysts used on research vehicles.

Discussion of these three subjects took up the rest of the working day and the meeting was adjourned in the early evening.

December 10 - The second meeting was again held in the conference room of the Ukraine Hotel. The first presentation was made by Mr. Charles Heinen of Chrysler representing the US Delegation. Mr. Heinen's subject was "Research and Development of Control Systems for Carbureted Engines". Mr. Heinen described the evolution of control devices used on production cars in this country up to and including those used on 1975 models.

A second presentation on the subject "Stratified Charge Engine Development in the Soviet Union" was made by Mr. Kerimov of the Azerbaijanian Polytechnical Institute. Mr. Kerimov provided an English translation of his report.

The third presentation on the subject "Exhaust Gas Oxidation Catalysts on the Basis of Manganese" was made by Dr. Bakhtadze of the Georgian Academy of Sciences. He reviewed the subject work on various manganese catalyst compositions.

Mr. Altman of NILTD then discussed "Methods of Sampling for Analysis of Benzo/a/pyrene in the Internal Combustion Engine Exhaust Gases". He pointed out the wide variation in data accumulated in the literature and discussed the specifics of the Soviet method.

The fifth presentation was made by Mr. DeKany on the subject of "Control of Aircraft, Ship, Motorcycle, and Diesel Locomotive Internal Combustion Engines". He discussed the regulatory program for aircraft emissions and our need for more information on supersonic aircraft emissions. He asked for comments by the Soviets on our aircraft regulations. The representative from the Soviet Ministry of Aviation responded with three basic questions; 1) how to meet the NOx standard without impairing the engine performance, 2) how to get an adequate sample of supersonic exhaust, and 3) how to assure adequate samples of subsonic exhaust. He indicated that he would provide detailed evaluation of the US regulations on an informal basis and requested that further involvement on aircraft emission work be done independent of the basic subject working group on transportation sources.

The next presentation was made by Dr. Kurov of the Ministry of Automobile Manufacturing on the subject "Methods of Automobile Toxicity Testing". Dr. Kurov discussed the relative merits of the ECE (European) versus CVS procedure and indicated that he felt the CVS procedure was good although the present analytical treatment of the data was unnecessarily complex. He was clearly alluding to the usefulness of a self-weighted cycle without the need for weighting and correction factors which was the original intent of the US procedure. He suggested the need for development of an international light duty and heavy duty cycle based on the CVS procedure.

The seventh paper on "Investigations in the Field of Internal Combustion Engine Toxicity Reduction" conducted by the Georgian Polytechnical Institute was presented by Professor Partskhaladze. He discussed the pollution problem as it relates to the various Soviet regions and various types of control measures studies at the institute. Some of the most interesting work involved variable compression ratio engines, pre-heated charge engines, and types of stratified charge concepts.

The next subject discussed was "Anti-Toxic Fuel and Lube Oil Additives". Dr. Somers, Mr. Heinen, and Mr. Stahman presented information on cerium compounds, manganese compounds, methanol, and Goodyear's butyl alcohols.

The session ended at approximately 6:30 p.m. and the American delegation prepared to depart for Leningrad. Travel to Leningrad was by overnight train in the company of Dr. Drozdov, head of the Soviet Delegation and his deputy Dr. Zhegalin.

After check-in the next morning (December 11) at the Leningrad hotel, the delegates travelled to CNITA, the Central Research Institute of Fuel Equipment for Automobiles. They were greeted by Dr. Sviridov, Director of the Laboratory and members of his staff composed of approximately 15 individuals. After brief introductions, Mr. DeKany presented a discussion of rotary engines in the United States in which he pointed out problems found by General Motors which resulted in delaying the introduction of their engine indefinitely. He also discussed the EPA evaluation of the Mazda engine in which the Mazda rotary was found to be inferior to the conventional engine in regards to fuel economy.

The second presentation was made by Mr. John McFadden on the subject of Feedback Control Fuel Injection Systems. He described the evolution of the Bosch fuel injection systems up to and including the lambda sensor system which has the ability of functioning with a 3-way catalyst.

The third presentation of the day was made by Dr. Sviridov on the subject of "Intensified Fuel Evaporation in Carburetor Fuel Delivery Systems". He discussed the work done on both gas turbine combustors and internal combustion engine combustion systems using the vaporized fuel delivery technique.

A fourth paper on the subject of stratified charge rotary engines was given jointly by Mr. Novikov and Dr. Sviridov. They described an "Investigation of Rotary Engines Running on Gaseous Fuel with Stratified Charge".

The meeting was followed by a tour through the CNITA laboratory where work on the following subjects was reviewed; 1) film combustion in gas turbine combustors, 2) electronic fuel injection development, 3) production control of Diesel fuel injection equipment, 4) turbine fuel control mechanism design, 5) fuel calibration laboratory with ambient chamber calibration techniques, 6) laser application to Schlieren photographs of injection patterns.

The next morning (December 12) the group met in the engine laboratory of CNITA where demonstrations were given of the fuel film evaporation technique applied to reciprocating engines and of the gaseous fuel powered stratified charge rotary engine.

The group returned to the Conference room where presentations were resumed first with Mr. DeKany on the subject of "Use of Hydrogen on Mass Transport Fuel". He reviewed the status of hydrogen technology in the United States and provided the conclusion that hydrogen does not seem to be a very promising fuel for the internal combustion engine for the primary reasons of storage problems and poor economics.

Mr. Stahman then reviewed four papers on the CVCC Stratified Charge Engine which summarized the development by Honda of their Engine Concept up to and including the optimization of that engine for fuel economy.

Dr. Sviridov then presented a paper on the study of various types of Diesel fuels. He discussed a number of studies conducted by his Institute on a wide range of heavy fuels.

The meeting was concluded by Dr. Shatrov of the Ministry of Automobile Manufacturing discussing work they have done on Manganese additives for octane number improvement. He indicated that four to five octane numbers could be gained at the 85 RON level with the use of 1/2 gram per litre of the manganese additive but that the vehicles were limited by carbon fouling of spark plugs after approximately 5000 kilometres of operation.

At the conclusion of the meeting the US delegates were given a brief tour of Leningrad and conducted to the railroad station where they returned to Moscow via overnight train.

The fifth day, December 13, 1974, was spent at the Ukraine Hotel in finalizing the protocol for future work and after the signing of that protocol in the afternoon session, the technical discussions of the US-USSR Working Groups were adjourned.

The American Delegation was honored to be invited to the residence of Mr. Timofievskiy for dinner that evening. The five delegates were taken to Mr. Timofievskiy's apartment flat where a dinner composed of approximately 20 types of Russian foods were presented followed by home movies. This get together in a Russian home was felt to be an important accomplishment and a strong indication of the rapport which has built up between the US and Soviet Delegations.

The final protocol document is appended to this report and it includes the scheduled forthcoming activities between the two working groups.

Attachment

cc: R. Stahman
J. Somers
J. McFadden
C. Heinen
E. Stork

PROTOCOL

Meeting of Experts of the USSR-US Working Group
on "Transportation Source Air Pollution Control Technology".

Based on the US-USSR Agreement on Cooperation in the Field of Environmental protection signed on May 23, 1972 and following the Memorandum of the Joint USSR-US Commission on Cooperation in the Field of Environmental Protection signed on September 21, 1972, the third meeting of the Soviet and American experts of the Working Group on the project "Transportation Source Air Pollution Control Technology" was held in Moscow from December 8 to December 15, 1974.

The duration of the meeting was shortened to one week due to the American party request. This meeting specified the main trends of cooperation and the program of joint works for 1975.

The Soviet delegation was headed by Drozдов Y.N., Director of the Central Scientific Research Laboratory of Engines Toxicity, Ministry of Tractor and Agricultural Machine Building.

The US delegation was headed by Mr. J.P. DeKany, Director of the Emission Control Technology Division, Environmental Protection Agency.

A list of participants is given in Attachment I and 2.

During the meeting both sides exchanged the information on the status of the problem of the transport vehicles emission control in both countries and on the cooperative Program implementation.

Both sides representatives made reports and presentations listed in Attachment 3.

The US delegation visited the Central Scientific-Research Institute of Fuel Equipment for Automobiles in Leningrad, where the representatives of both parties made their reports and presentations.

Both sides came to an agreement that due to the different extent of pressure of the motor vehicles emission problem in each country and due to the different interest in solving the similar aspects of the problem for each of the two sides the previous program /See Attachment 4, Protocol of the second USSR-US experts meeting signed on April 26, 1974, Washington/ should be partially changed. After the discussion of detailed suggestions by both sides a more precise cooperative program for 1975 was worked out, separate parts of which have to be implemented in the following years /See Attachment 4/.

Both sides agreed to exclude from the cooperation program former theme III "Transportation planning and traffic control as means of reducing toxic emissions from transportation sources".

Both sides admitted the necessity to start and/or continue work in the field of reduction the emissions from non-automobile sources.

Both sides pointed out that the most acceptable forms of cooperative work on the program "Transportation Source Air Pollution Control Technology" for the nearest years are:

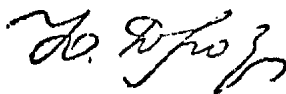
- cooperative development of methodological principles of standardization for toxic exhaust emissions from all types of mobile sources as well as methodological principles for investigation of elements interrelation within the system "mobile sources - atmosphere";

- exchange of control systems prototypes and results of their testing under different climatic conditions;

- exchange of information on the results achieved in all technological aspects of the problem "Transportation Source Air Pollution Control Technology".

Both sides noted with satisfaction that the meeting was held in the spirit of mutual understanding and cooperation. The sides agreed to hold the next meeting of the Working Group in the USA in the I-st half of 1975 and to have the following meeting of experts in the USSR in the 2-nd quarter of 1975.

This protocol was signed on December 13, 1974, in Moscow in two copies, in Russian and English; both languages equally authentic.



Y.N. Drozdov,
Head of the USSR Delegation,
Chief of the Central Scientific
Research Laboratory of Engines
Toxicity,
Ministry of Tractor and
Agricultural Machine Building.



J.P. DeKany,
Head of the USA Delegation,
Director of the Emission
Control Technology Division,
Environmental Protection
Agency.

USA delegation

Mr. J. P. DeKany,
Director, Emission Control Technology Division /ECTD/,
Mobile Sources Pollution Control /MSPC/,
Office of Air and Waste Management /OAWM/,
Environmental Protection Agency /EPA/.

Mr. R. C. Stahman,
Chief, Test and Evaluation Branch,
ECTD,
MSPC,
OAWM,
EPA.

Mr. Ch. M. Heinen,
Director, Emission Control Program,
Chrysler Corporation.

Mr. J. Somers,
Specialist on catalysis,
EPA.

Mr. J. McFadden,
Specialist on diesel and stratified charge technology,
EPA.

USSR delegation

I. USSR Working Group

Dr. Drozdov Y.N./Head of Group/,
Director, Central Research Laboratory of the Engines Toxicity - NILTD,
Ministry of Tractor and Agricultural Machine Building - MTAMB.

Dr. Zhegalin O.I.
Deputy Director of NILTD,
MTAMB.

Machulskiy F.F.
Chief, Section for Coordination and International Cooperation,
NILTD,
MTAMB.

Belozerova E.I.
Senior Scientific Worker,
NILTD,
MTAMB.

Dr. Shatrov E.V.
Chief, Gasoline ICE Division,
Central Research Automobile Institute - NAMI,
Ministry of Automobile Manufacturing - MAM.

Dr. Kurov B.A.
Chief, Laboratory of Gasoline ICE Toxicity,
NAMI,
MAM.

Kutenev V.F.
Chief, Emissions Division, Automobile Proving Ground,
NAMI,
MAM.

Dr.Gorbatko A.A.

Representative of the Central Research Institute
of Aircraft Engines, - CIAM,
Ministry of Aircraft Industry.

USSR Experts

Dr.Bakhtadze V.Sh.

Chief,Laboratory of Catalysis,
Institute of Electrochemistry, - INHEL,
Georgian Academy of Sciences.

Dr.Belyi S.A.

Chief,Section for Neutralisation Systems,
NILTD.

Assistant prof.,dr.Xerimov N.K.

Head the Department of Heat Engineering and Engines,
Azerbaijani Polytechnical Institute, - AzPI.

Maslenkovskiy L.D.

Chief,Sector for Chemical Research,
NILTD.

Dr.Panchishnyi V.I.

Chief,Sector of Special Materials and Catalysis,
NILTD,

Prof.,dr.Parts Khaladze R.M.

Chief,Laboratory for Traffic Safety,
Georgian Polytechnical Institute, - GrPI..

Dr.Sviridov Y.B.

Director,Central Research Institute of Fuel
Equipment for Automobiles, - CNITA

Timofievskiy A.A.
Chief Designer of the Project,
NILTD.

Dr.Frenkel A.I.
Chief, Sector for Diesel Neutralization,
NILTD.

Dr.Shustov G.N.
Chief, Sector for Physicochemical Processes,
NILTD.

I. List of reports and presentations by USSR representatives.

1. Current status of toxicity reduction from ICE in the USSR and fulfilment of the plan for Soviet-American cooperation.
2. Methods of automobile toxicity testing.
3. Sampling methods for analysing benz/a/pyren in ICE exhaust gases.
4. Stratified charge engines.
5. Exhaust gases oxidation catalysts on the basis of manganese.
6. Investigations in the field of ICE toxicity reduction conducted by Georgian Polytechnical Institute.
7. Intensified fuel evaporation in carburetor fuel delivery systems.
8. Investigation of rotary engines running on gaseous fuel with stratified charge.
9. New fuel types for ICE.

II. List of papers and presentations by USA representatives.

1. State of the problem of ICE toxicity reduction in the USA and fulfilment of the program of Soviet-American cooperation in this field.
2. Research and development of pelleted and monolithic catalysts for oxidation and reduction.
3. Research and development of control systems for carbureted engines.
4. Control of aircraft, ships, motorcycle and diesel locomotive ICE.
5. Anti-toxic fuel and lube oil additives.
6. Use of hydrogen as mass transport fuel.
7. Development of electronic feedback control of fuel systems.
8. CVCC process.
9. Rotary engines toxicity and prospects of their application.

Attachment 4

PROGRAM

of the USSR-USA cooperation on the project
 "Transportation Source Air Pollution Control Technology".

Subject	Cooperating Agencies	Form of cooperation	Date of fulfillment and notes
	USSR USA		
2	3	5	6
Development of the uniform methodological basis of standardization of emissions for all types of mobile sources and methodological principles of investigation of elements interrelations within the system "mobile sources - atmosphere".			
I.1. Study of uniform methods for determination of emissions from transportation vehicles/cars and trucks/powered by gasoline and diesel engines.	NAMI NILTD	Exchange of information	1975/cont.in 1976/
I.1.1. Study of a uniform test cycle-UTC-for cars with gasoline engines including evaluation of USA, Japanese and European driving cycles.	NAMI Proving Ground NILTD	Discussion of study results on UTC at the Working Group/WG/meeting in USA.	II quarter 1975.
I.1.2. Development of UTC for trucks with gasoline ICE.	"-	"-	"-
I.1.3. Development of UTC for trucks with diesel ICE.	"-	Preliminary exchange of information. Discussion of study results on UTC at the experts meeting in USSR	II quarter 1975. II half 1975.

- 2 -

1	2	3	4	5	6
I.1.2. Study of a uniform method of evaluation for motorcycle emissions	Proving Ground NILTD	EPA	Exchange of information and detailization of co-operation plan at WG meeting in the USA	II quarter 1975. The USSR party will identify the agency and develop a plan by the date of the meeting in the USA	
I.1.3. Study of air quality and methodology for determination of interrelationships between mobile sources and the atmosphere.	NILTD	EPA	Exchange of information by correspondence and at the experts meeting in the USSR	II half 1975. Both parties will choose these aspects of investigation which they are interested in and will prepare reports for the experts meeting.	
I.1.4. Investigation of sampling methods and methods of ICE emissions analysis for polynuclear aromatic hydrocarbons.	NILTD	EPA	Exchange of information and delivery of samples of chemicals agents as far as possible.	I half 1975 II half 1975 The USSR will forward to USA information on sampling methods and method of analysis for benz/a/pyren used in USSR. The USA if possible will provide the samples of chemical agents according to special list	
2. Investigation of methods for the reduction of vehicle emissions	NILTD NAMI CNITA AzPI GrPI INHEL	EPA			
2.1 Improvement of ICE working processes by engine modifications	NAMI CNITA AzPI GrPI	EPA	Exchange of information	2 half 1975	
2.2 Investigation of emission control devices including low	NILTD NAMI CNITA	EPA	Exchange of information	I half 1975	

- 3 -

I	2	3	4	5	6
toxicity fuel equipment, low emission fuels and fuel additives	Exchange of antitoxic devices prototypes for testing				II half 1975 At the WG meeting in the II half the parties will define the list of prototypes and dates of exchange II half 1977
2.3. Investigation of smoke and emission reduction methods for diesel.	NAMI NILTD	EPA	Exchange of information		II half 1975 At the WG meeting in the II half the parties will identify catalysts and will exchange information on their testing results in II half 1975 II half 1977
2.4. Investigation of oxidation and reduction catalysts for exhaust emissions of ICE	INHEL NILTD	EPA	Exchange of information		II half 1975 Each party will provide available information on any of above mentioned aspects of the project.
2.5. Investigation of advanced catalytic converter systems for gasoline ICE including data under extreme climatic conditions	NILTD NAMI CNITA	EPA	Exchange of information in available volume		II half 1975 Each party will provide available information on any of above mentioned aspects of the project.
3. Mutual exchange of information on technological aspects of the project "Transportation Source Air Pollution Control Technology" which are developed and investigated in both countries.	NILTD NAMI CNITA	EPA	Exchange of information, including the following questions: -low- toxic modifications of traditional piston ICE, -advanced low-toxic ICE, -advanced fuels for ICE, -mobile sources of non-automobile type.		II half 1975 Each party will provide available information on any of above mentioned aspects of the project.